

## ESTUARINE EUTROPHICATION CONDITIONS

### What does the indicator tell us?

**T**his indicator shows changes in specific constituents related to water quality that together can be used to assess the extent of eutrophication within an estuary, and thus assess its health and condition. Eutrophication is a process by which a body of water begins to suffocate from receiving more nutrients, such as nitrogen and phosphorus, than it can handle. The excess nutrients fuel the heavy growth of microscopic aquatic plants. As these plants die and decompose, the supply of dissolved oxygen in the water is depleted and its availability to other aquatic organisms, especially those which live on the bottom, is reduced. Symptoms of eutrophication include low levels of dissolved oxygen, extensive algal blooms, fish kills and reduced populations of fish and shellfish, high turbidity in the water, and diebacks of seagrasses and corals. Monitoring the changes in parameters such as chlorophyll *a*, nitrogen, and other nutrient concentrations; concentrations of dissolved oxygen; and the spatial coverage of seagrasses (or submerged aquatic vegetation) helps assess whether estuarine and coastal waters are receiving too many nutrients.

This indicator shows trends in eutrophication-related conditions from the 1960s to 1995 in selected estuaries throughout the country as measured by two different data sets. The nationwide framework for the indicator of estuarine eutrophication is NOAA's *National Estuarine Inventory*. The 129 estuaries contained in the inventory represent a consistent and complete framework for characterizing the Nation's estuarine resource base. NOAA is collecting information on 16 eutrophication-related water quality parameters for each estuary in the inventory through a knowledge-based consensus process with over 400 estuarine scientists. In 1990, NOAA estimated that nearly half the Nation's estuaries were susceptible to eutrophication. In 1992, NOAA initiated its *National Estuarine Eutrophication Survey* to evaluate which estuaries had problems in the following regions: North Atlantic (16 estuaries), Mid-Atlantic (22 estuaries), South Atlantic (21 estuaries), Gulf of Mexico (36 estuaries), and the West Coast (34 estuaries).

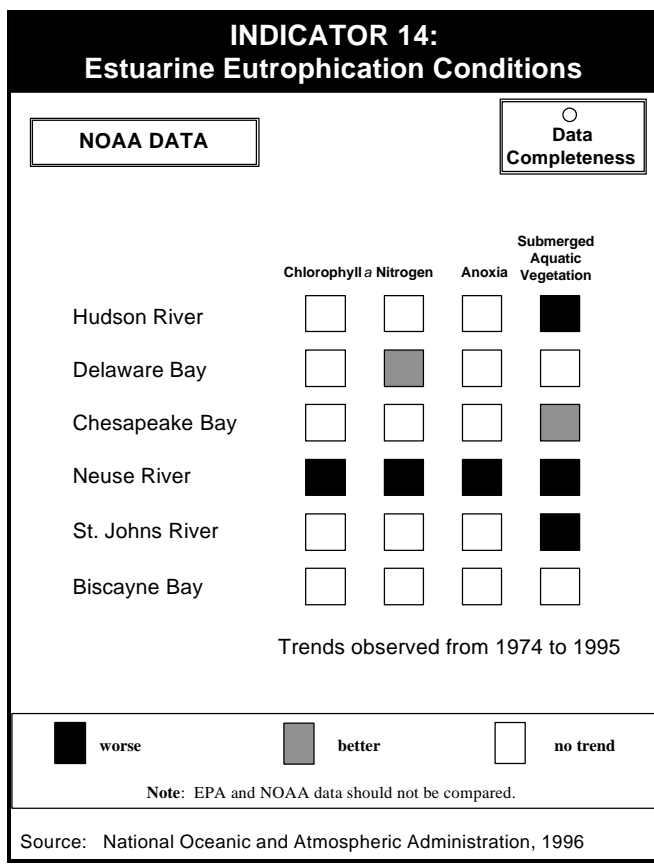
This indicator also uses data from EPA's National Estuary Program (NEP). Currently, there are 28 estuaries around the country in the NEP. In many of these estuaries, state and local managers have identified eutrophication and excess nutrients as critical problems. NEPs are collecting historical and baseline monitoring information to assess the effectiveness of corrective actions being undertaken. Taken together, the

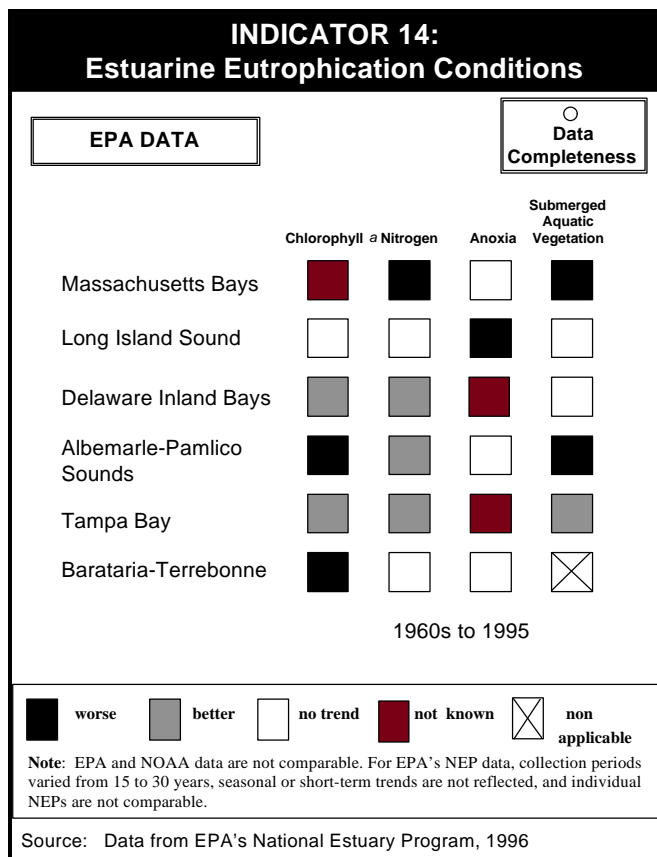
NOAA and EPA efforts will provide the most comprehensive and complete information base possible for the foreseeable future.

### How will the indicator be used to track progress?

**B**ased on data collected from mailed survey responses, individual interviews, and regional workshops in January 1995 and February 1996, NOAA compiled information on eutrophication trends from 1974 to 1995 and existing eutrophication conditions in estuaries in the Mid-Atlantic and South Atlantic regions. NOAA will be releasing a summary report of this information in mid-1996. The remaining regions will be completed later in 1996. Data will be collected and an indicator estimation made every 5 years.

For the NEP data, those NEPs which have identified eutrophication or its parameters as priority problems will develop monitoring plans to (1) evaluate trends in key variables, (2) link the observed patterns to specific management actions, and (3) provide information to redirect





and refocus actions based on monitoring results. Because it is difficult to establish immediate causal relationships between specific actions and environmental change, NEP monitoring plans try to reinforce the understanding that tracking progress depends on a commitment to long-term data collection. At the national level, EPA has published examples of NEPs that have developed a "Bay Quality Index," which offers a suite of parameters and conditions, including eutrophication, that can be used to capture a composite picture of an estuary's overall quality and major components. Tracking the extent and changes in eutrophic conditions helps to highlight the water quality impacts of activities in a watershed and gauge the effectiveness of pollution controls and other management actions.

### What is being done to improve the indicator?

Despite a variety of monitoring efforts by many different organizations and agencies, including EPA and NOAA, data on eutrophication parameters for most estuaries in the NEP are either incomplete or not comparable. Differences in monitoring parameters, methods, and sampling stations and periods make it difficult to establish trends even within a single estuary. Factors such as seasonality, spatial relationships, and level of monitoring effort also affect the interpretation and value of data. These

difficulties are compounded when comparisons are made between different estuaries because each estuary responds to the stress of excess nutrients based on its own physical and biological circumstances.

NOAA has attempted to address this problem by applying a consistent survey technique to characterize the scale and scope of past and present eutrophication levels. NOAA has also initiated a process for improving the indicator that involves interviews and workshops at the local and regional levels. NOAA is planning a national eutrophication workshop later in 1996. The workshop will determine the best way to aggregate parameters estimated for each estuary into an overall indicator.

For the NEP data, EPA will participate with NOAA in its national workshop and facilitate the inclusion of data collected by individual estuary programs. By working together, NOAA, individual NEPs, and EPA hope to improve the availability of nationwide information on eutrophication and other indicators in the NEP. The integration of NOAA and EPA data into a single, unified indicator marks the beginning of these efforts.

### What is being done to improve conditions measured by the indicator?

Control of nutrients is a critical factor in preventing eutrophication. Approaches for controlling nutrients range from expensive engineering to simple prevention and maintenance. In Long Island Sound, for example, effluent from wastewater treatment plants is the primary nutrient source, and many facilities have begun retrofitting their processes to remove nitrogen. In contrast, in other areas controlling fertilizer runoff from farms, residences, and managed greenways such as golf courses is the most effective solution. Yet other communities are establishing more stringent zoning or encouraging the use of denitrifying septic systems to reduce nitrogen loadings to ground water. What these approaches have in common is a process that reflects local conditions by carefully identifying the sources of nutrients, calculating their contributions to specific water-quality problems, and working with a variety of tools to reduce their impacts.

#### *For More Information:*

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